

Marking scheme for practice exam-style paper

Paper 4 Core and Supplement

The number of marks is given in brackets [] at the end of each question or part question.

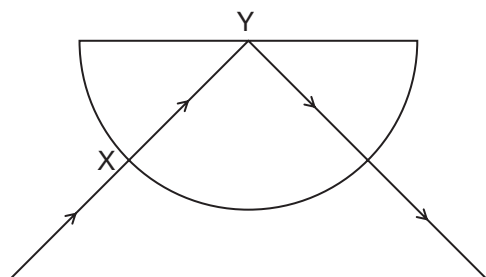
- 1 a 400 [1]
b $508 \text{ g} - 140 \text{ g} = 368 \text{ g}$ [1]
c density = mass/volume
 $= 368/400$
 $= 0.92 \text{ g/cm}^3$ [3]
[Total: 5]
- 2 a $15 \text{ m/s} \times 30 \text{ s}$
 $= 450 \text{ m}$ [2]
b $\frac{1}{2} \times 20 \text{ m/s} \times 30 \text{ s}$
 $= 300 \text{ m}$ [2]
c $a = \text{change in speed/time taken}$
 $= 20/30$
 $= 0.67 \text{ m/s}^2$ [3]
[Total: 7]
- 3 a upward arrow in line with weight arrow [1]
b 0 or zero [1]
0 or zero [2]
c weight arrow downwards
velocity arrow downwards [2]
[Total: 6]
- 4 a mechanical working [1]
b energy transferred = mgh
 $= 450 \times 10 \times 15 = 67\,500 \text{ J}$ [2]
[Total: 3]

- 5 a vibrations
about fixed positions [2]
- b properties that increase: the internal energy of the solid, the amplitude of the vibrations of the particles, the separation of each particle from its neighbours [2]
- c strip bends uniformly
with aluminium on outside of curve [2]
- [Total: 6]

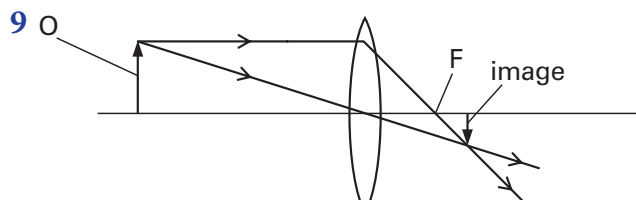
- 6 a temperature rise = 40 °C
heat capacity = energy/temperature rise
= 480/40
= 12 J/°C [4]
- b mass of the pebble [1]
- [Total: 5]

- 7 a energy/infra-red radiation from the surroundings is absorbed by the containers and is transferred to the ice [2]
- b container B
black surfaces absorb infra-red radiation better than white ones [2]
- c put hot water inside each container
measure temperatures
the better emitter cools faster [3]
- [Total: 7]

- 8 a the angle of incidence is 0° or the ray is travelling along the normal [2]
- b ray reflects at Y with angles approx. correct
and does not refract/bend where it leaves the block [2]



- c $\sin c = 1/n$
= 1/1.42 = 0.704
 $c = \sin^{-1} 0.704 = 44.8^\circ$ [3]
- [Total: 7]

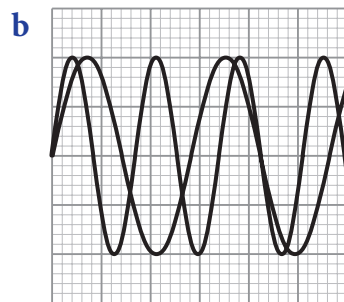


- a** principal focus F marked [1]
b line drawn vertically and image position marked between ray crossing and axis [2]
c diminished, inverted, real [3]
d closer to the lens than F *or* between F and the lens [1]

[Total: 7]

- 10 a** wavelength = speed/frequency
 = $330/20$
 = 16.5

[3]



same height
 longer waves on screen

[2]

[Total: 5]

- 11 a** 1 minute = 60 s
 charge = current \times time
 = $0.25 \times 60 = 15$ C
- b** $V = IR$
 = $0.25 \times 24 = 6.0$ V
- c** $1/R = 1/24 + 1/12 = 3/24 = 1/8$
 $R = 8.0$ W

[3]

[2]

[2]

- d** ammeter reading will increase
 because the resistance in the circuit is less
 and so the current will increase.

[3]

[Total: 10]

- 12 a** the magnetic field in/linking the coil is changing
so an e.m.f is induced in it *or* an induced current flows in the coil [2]
- b** use a stronger magnet *or* move the magnet faster *or* use a coil with more turns
of wire [1]
- c** zero/0 V
because the magnetic field is not changing [2]
- d** north (N) pole [1]
- [Total: 6]**

- 13 a** neutron number = nucleon number – proton number
 $= 19 - 8 = 11$ [2]
- b** nucleon number unchanged, proton number increases by 1
so ${}^{19}_9\text{F}$ [2]
- c** $60 \text{ s} = 2$ half-lives
 $1000/4 = 250$ [2]
- [Total: 6]**